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Office of Environment Management
Office of Science and Technology

FY 1999

ANNUAL REPORT



Environmental Measurements Laboratory

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DIRECTOR'S MESSAGE

In Fiscal Year 1999, the Environmental Measurements Laboratory (EML) made major advances in the development and deployment of radiological field characterization and monitoring technologies. Highlights included the development and demonstration of PASS, a portable aerosol sampling system to be deployed at the Fernald Environmental Management Project (FEMP). Also, EML continued its efforts to have *in situ* gamma-ray spectrometry accepted by industry as a high quality measurement technique that can be used in place of, or in conjunction with, traditional soil sampling and laboratory-based analytical methods. These real-time measurements at FEMP are projected to save more than 30 million dollars in measurements costs and will help the 2006 Closure Schedule to proceed without delays due to analytical overload.

In our role as a federal technical lead, EML supports EM's site cleanup and closure activities by providing an unbiased and responsive technical capability to assure quality in sampling, measurements and analyses, and risk assessments. Highlights of our FY 1999 successes in this area include EML's participation in two technology deployment programs, the Brookhaven National Laboratory's Peconic River plutonium contamination study, and the West Valley closure engineering work. In addition, EML is leading the Center for Risk Excellence's efforts in modifying the Cleanup Criteria Decision Document. EML has also been designated as a reference laboratory for the DOE Radiological Traceability Program. Of special note, an EML scientist received Vice President Gore's Hammer Award for participating on the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Work Group.

In our mission to provide DOE and other federal agencies with an in-house, high-quality scientific capability to address important issues related to national security such as nonproliferation, EML has been named as the U.S. Radionuclide Laboratory for the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

In continuing more than 50 years of a tradition of excellence, EML in FY 1999 achieved great successes for our customers, and we will strive to continue to be a unique and vital federal resource into the next millennium.

Mitchell D. Erickson, Director

OVERVIEW

The Environmental Measurements Laboratory (EML) is a federal technical resource with a distinguished 50-year reputation in low-level environmental radiation and radioactivity measurements. It is government-owned, government-operated, reporting programmatically to the Office of Environmental Management, and administratively to the Chicago Operations Office.

MISSION

EML

Conducts scientific investigations and develops technologies related to environmental restoration, site and facility characterization, and environmental surveillance and monitoring.

EML

Provides DOE and other federal agencies with an unbiased and responsive technical capability to assure quality in sampling, measurements and analyses, and risk assessments of human exposure to radioactivity and other energy-related pollutants.

EML

Provides DOE and other federal agencies with an in-house, high-quality scientific capability to address important issues related to national security such as nonproliferation.

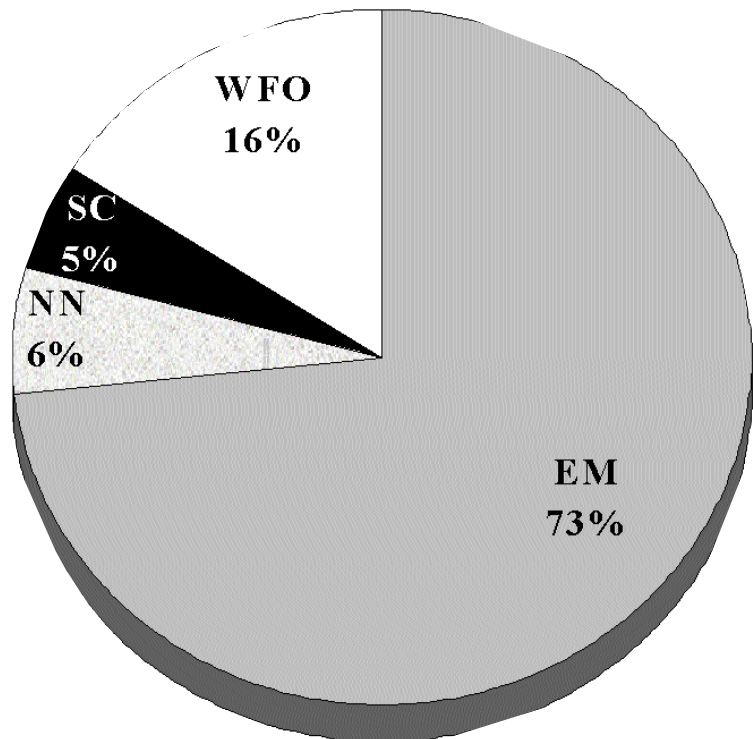
STRATEGY

EML serves a broad range of federal customers, primarily in DOE, but also across agencies that require applied research and operational capabilities in environmental measurements, quality assurance, and contaminant detection technologies. EML's primary near-term strategy for fulfilling its mission is to continue its development of technologies, measurement systems and software, to seek partnerships with DOE field offices for deployment opportunities, and to provide quality assurance and management support. EML's FY 1999 federal customers included: DOE Office of Environmental Management (EM), DOE Office of Science (SC), DOE Office of Nonproliferation and National Security (NN), the Air Force (AF), Defense Threat Reduction Agency (DTRA), Environmental Protection Agency (EPA), Nuclear Regulatory Commission (NRC), and the National Aeronautics and Space Administration (NASA).

Aside from the various principal customers and facilities specified in this report, EML also provides expert technical advice on environmental radiation and radioactivity to many other DOE sites, other U.S. government agencies, international organizations, and the private sector. This assistance reflects the overall larger role the Laboratory plays as a federal technical resource in sharing its knowledge and experience and promoting efficiency of operations throughout the nation and the world. Examples of those assisted in FY 1999 include: Ames Laboratory, Princeton Plasma Physics Laboratory, Army Corps of Engineers, Government Accounting Office, Rock Island Arsenal, the International Atomic Energy Agency, the Comprehensive Test-Ban-Treaty Organization, Albert Einstein School of Medicine, Electric Power Research Institute, and EG&G ORTEC.

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FUNDING BY CUSTOMER



Our customers identified in the above funding chart and in boxes on the right-hand side of the project descriptions to follow are: EM, SC, NN and Work for Others (WFO), which includes EPA, NRC and NASA, among others.

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ONDUCTS SCIENTIFIC INVESTIGATIONS AND DEVELOPS TECHNOLOGIES RELATED TO ENVIRONMENTAL RESTORATION, SITE AND FACILITY CHARACTERIZATION, AND ENVIRONMENTAL SURVEILLANCE AND MONITORING

EML supports EM cleanup and closure activities at DOE sites by developing, demonstrating and deploying advanced radiological measurement and survey methods and instruments; by assisting in the collection, interpretation, and modeling of radioactive contaminant data in special low-level (at or near background) situations; and by insuring the overall quality, cost effectiveness and industry acceptance of field radiation

measurement technology. EML is especially involved in Deactivation and Decommissioning (D&D) activities throughout the DOE complex with projects including: *in situ* gamma-ray spectrometry, accelerated site technology deployment projects, and innovative data interpretation techniques for “hot spot” assessments. The following are highlights of these D&D and other scientific accomplishments for FY 1999.

IN SITU GAMMA-RAY SPECTROMETRY DEVELOPMENTS

EM, EPA



To help reduce the costs and time associated with the environmental cleanup taking place within the DOE complex requires innovative measurement techniques of radioactive contaminants during site characterization work as well as certification of areas following remediation. *In situ* gamma-ray spectrometry is a technique that provides information on the concentrations for specific radionuclides that are present in soil and building materials. As the leading developer of this technique, EML continued its efforts to have *in situ* gamma-ray spectrometry accepted by industry as a high quality measurement technique that can be used in place of, or in conjunction with, traditional soil sampling and laboratory-based analytical methods. Technical inquiries



and guidance were provided to DOE sites, manufacturers, regulators and other government agencies. In particular, EML partnered with EPA to demonstrate *in situ* gamma-ray spectrometry techniques at the Aberdeen Proving Ground. The U.S. Army is anticipating using this technique to address depleted uranium contamination at DoD facilities and is interested in a cooperative effort with EML and EPA.

ACCELERATED SITE TECHNOLOGY DEPLOYMENT (ASTD)

EM

EML has partnered with the Fernald Environmental Management Project (FEMP) and Brookhaven National Laboratory (BNL) on two ASTD projects:

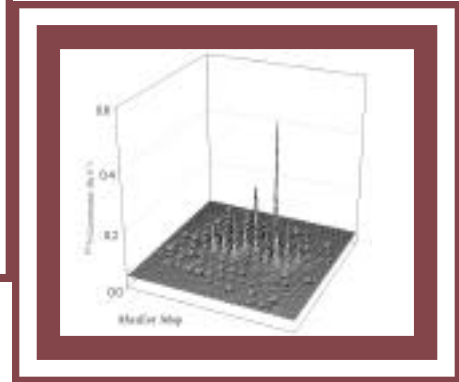
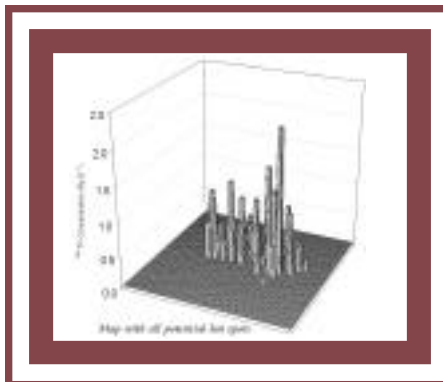
FEMP Activities continued with FEMP on “Deployment of an Integrated Technology Suite for Cost-Effectively Delineating Contamination in Soils in Support of Soil Remedial Actions” at the Ohio Field Office. This project supports EM’s Office of Science and Technology (OST) Subsurface Contaminants Focus Area (SCFA). *In situ* gamma-ray spectrometry is deployed at FEMP for characterization, excavation control and precertification activities.

BNL The ASTD project with BNL, “Deployment of Innovative Characterization Technologies and Implementation of the MARSSIM Process at Radiologically Contaminated Sites,” supports OST’s Deactivation and Decommissioning Focus Area (DDFA). EML’s role involves the application of MARSSIM (Multi-Agency Radiation Survey and Site Investigation Manual) methodology for radiological surveys and *in situ* gamma-ray spectrometry to stabilize and decommission the Brookhaven Graphite Research Reactor (BGRR).

“HOT SPOT” ASSESSMENT

EM

EML has advanced the state of the art in interpreting *in situ* gamma-ray spectrometry results with the development of a deconvolution method for closely spaced measurements. Both smooth distributions and potential “hot spots” of gamma-emitting radionuclides can be mapped with this technique. The deconvolution code was also modified to allow for the inclusion of soil sample data in conjunction with *in situ* gamma-ray results. The code was demonstrated at the Aberdeen Proving Ground for the detection of depleted uranium.



AEROSOL MEASUREMENTS COMPARABILITY STUDIES

EM



To better quantify the air component of the dose to the population in the FEMP area, EML set up specialized aerosol sampling equipment at FEMP's fence line. For the past year, the equipment has been co-located with a high volume sampler to establish comparability of the samplers. The data obtained during FY 1999 indicate that the particle size distribution of uranium and thorium bearing aerosols must be considered to better improve the calculations of the dose to the population from Fernald's activities.

PORTABLE AEROSOL SAMPLING SYSTEM (PASS)

EM

To meet the needs of Fernald in dose studies, EML designed, engineered and successfully completed a one-year demonstration of a sampler to make size distribution measurements for remote sampling at FEMP. PASS is lightweight, has a low air flow, uses low d. c. power, and is automated for the collection of uranium bearing ambient aerosols. PASS is successfully operating at the fence line of FEMP and at Miamitown, Ohio, the upwind site from FEMP.



CESIUM 2K ANALYZER

EM

EML has begun the development of a Cesium 2K Analyzer. The objective of this project is to develop an inexpensive, lightweight, portable field instrument to measure ^{137}Cs that has been collected on 3M™ Empore Disks. The design of this analyzer is based on a microcomputer which will make it easy to use, while keeping the cost below \$2000, which is one-fifth the cost of using a more conventional multichannel analyzer approach. Once developed, the Cesium 2K analyzers will be used for monitoring D&D operations at DOE sites.

RADON INSTRUMENTATION

EM

A considerable inventory of radium and compounds exists in contaminated soils and facilities across the DOE complex. As a decay product of radium, radon forms an essential component of the monitoring needs for DOE. EML is applying its expertise in radon and radon progeny measurements to assist the FEMP in data interpretation near the K-65 silos. Among EML's most successful technology development activities in its 50-year history are various radon instrumentation innovations and engineering designs. In FY 1999, several radon monitor and sensor technologies were deployed at various sites, are ready for implementation, or are in various stages of development (see also the section on the Radometer in the CTBT section).



ATMOSPHERIC MONITORS EML's near real-time ^{222}Rn atmospheric monitors have been deployed at the Mauna Loa Observatory (a regional baseline station of the National Oceanographic and Atmospheric Administration (NOAA)/Climate Monitoring and Diagnostics Laboratory) and the Atmospheric/Ocean Chemistry Experiment (AEROCE) Station at Tudor Hill, Bermuda. These monitors have provided a unique source of reliable ^{222}Rn data to the scientific community since 1990. Researchers use the data to help determine air mass provenance and the timing of events transporting air that has been in contact with a landmass to the oceanic measurement sites. Additionally, atmospheric modelers use these rare databases, available on the EML Web Site, to test and validate the transport component of general circulation models.

In FY 1999, a ^{222}Rn monitor, deployed at the Finland Global Atmosphere Watch Station in Pallas (as part of a collaboration with the Finnish Meteorological Institute) continues to provide critical data for determining air mass transport events.

BARREL RADOMETER EML has designed, built a prototype, and is now testing the Barrel Radometer instrument to replace the much larger atmospheric monitors. Although the entire instrument and support electronics are contained in a weatherproof 50 gallon drum, the Barrel Radometer has a ^{222}Rn sensitivity comparable to the atmospheric monitors. EML has been collaborating with Advanced Power Technology, Inc. to strategize the commercialization of the Barrel Radometer.





EML has been doing research in neutron spectrometry (measuring the energy distribution of neutron radiation) for over 30 years. Neutron spectrometry is essential for understanding the risks to human health caused by neutron radiation.

To determine doses from cosmic radiation, especially neutrons, to occupants of high-altitude aircraft, EML and the NASA Langley Research Center (LaRC) started the Atmospheric Ionizing Radiation (AIR) Measurements Project, with an EML scientist as the Principal Investigator. The AIR Project is an international collaboration of 12 laboratories that placed 14 instruments on multiple flights of a NASA ER-2 high-altitude aircraft. The primary instrument is the EML high-energy multi-sphere neutron spectrometer (HEMNS).

In FY 1999, work concentrated on accurately determining the response of the EML HEMNS and developing advanced spectrum analysis methods. Improved response calculations were begun using the new Los Alamos high-energy radiation transport code MCNPX. Scientists and engineers from EML, the Los Alamos Neutron Science Center (LANSCE), and LaRC performed an experiment at LANSCE to measure the response of the EML HEMNS to a known spectrum of high-energy neutrons in an energy region where calculations of the response have large uncertainties.

EML is planning to apply the spectrometry capabilities developed in this project to neutron measurement needs for assessing environmental-level doses at DOE's high energy accelerators and for advancing detection methods in support of nonproliferation activities.

GROUNDWATER MODELING

EM

EML is utilizing a state-of-the-art three-dimensional groundwater model to examine and predict the transport of uranium contamination at Fernald, Ohio for the FEMP. During FY 1999, an advanced graphical data visualization technique was developed in collaboration with IBM. The technique was used to perform model simulations and to analyze and display the complex three-dimensional model results and observations of the contamination surrounding FEMP. EML's work will improve the current FEMP groundwater model for cleanup of FEMP's groundwater plumes by helping to determine the minimum number of conventional extraction wells necessary to restore the sole source residential drinking water aquifer for FEMP within a reasonable time frame.

P

ROVIDES DOE AND OTHER FEDERAL AGENCIES WITH AN UNBIASED AND RESPONSIVE TECHNICAL CAPABILITY TO ASSURE QUALITY IN SAMPLING, MEASUREMENTS AND ANALYSES, AND RISK ASSESSMENTS OF HUMAN EXPOSURE TO RADIOACTIVITY AND OTHER ENERGY- RELATED POLLUTANTS

EML's long-standing reputation for excellence in environmental measurements has led to its being called upon for assistance and consultation by numerous organizations in the U.S. and around the world. The Laboratory fulfills special needs within the scientific community outside of DOE that

relate to the assessment of radiation and radioactivity in the environment. Projects of this nature, highlights of which are discussed below, are a natural extension of the staff's collective expertise and are in keeping with a larger role that a specialized laboratory such as EML plays within the DOE family.

ANNOUNCEMENT OF PARTNERING AGREEMENT

Stan Morton, Director, NAMP, and Mitchell D. Erickson, Director, EML, announced a Memorandum of Agreement with the Office of Site Operations, the Office of Science and Technology, NAMP and EML to promote quality in the planning, management, and performance of radioanalytical characterization and monitoring data collection activities in support of DOE's environmental quality initiatives.



The National Analytical Management Program (NAMP) objectives are to assure EM credible, cost-effective data for environmental decision making and compliance. EML supports NAMP through the following activities: Quality Assessment Program (QAP), development of quality control materials, gamma spectrometry data evaluation, methods development and validation, traceability activities, and interagency collaboration and representation on standards committees and work groups concerned with laboratory data quality or validation of new radioassay methods.

NIST TRACEABILITY

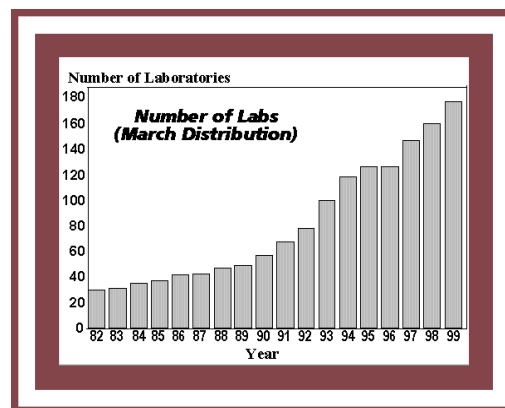
NAMP, under its mission to provide scientific support to EM for the quality of its radiological data, has established the DOE Radiological Traceability Program (RTP). EML, because of its unique capabilities in the detection and quantification of radioactivity and in the preparation of radioassay testing materials, has been designated as a Reference Laboratory for the RTP. RTP will enable laboratories that perform analytical radiological testing for EM to establish traceability to the National Institute of Standards and Technology (NIST), the U.S. national standard for radioanalytical measurements.

EM

QUALITY ASSESSMENT PROGRAM

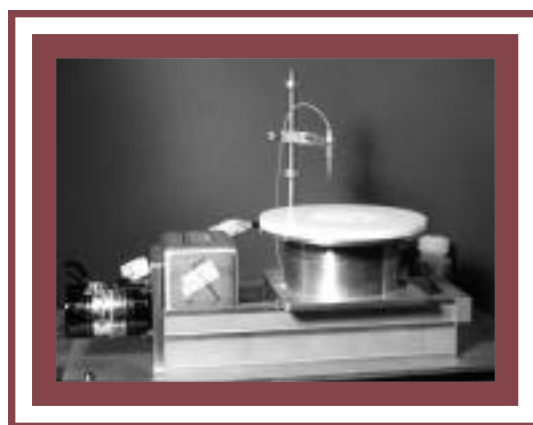
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EML's QAP is an external, independent performance-based evaluation program designed to test the quality of environmental radiological measurements reported by DOE contractor and subcontractor laboratories. The program provides EM with complex-wide comparability of environmental radiological analyses for characterization, site survey and monitoring activities. In FY 1999, there were 173 national and international participants. Participation of EM contractors is required by DOE Secretarial Memorandum (March 1993). A summary of the evaluation of reported results, issued in January and July, is available to the participants 48 hours after the reporting deadline via the EML Web Site. This rapid access to the data is a unique feature. As part of the QAP, EML provides quality control materials for corrective actions, methods evaluation and batch control as requested by the participating laboratories.



AUTOMATED MICROPIPETTE SYSTEM

An automated micropipette system, designed at EML to spike filter samples for the QAP program, delivers a highly accurate volume of solution in a programmable pattern. EML has fabricated this device for other customers. A similar system was fabricated and deployed for the International Atomic Energy Agency.



GAMMA SPECTROMETRY DATA EVALUATION PROGRAM

EML continued its Gamma Spectrometry Data Evaluation Program to provide DOE with an assessment of the participating laboratories and contractors in their performance of gamma-ray spectra analyses required for EM projects and site characterizations. This is a voluntary program designed to test the ability of the gamma spectroscopist to accurately identify and quantify nuclides in both routine and more complicated analyses using synthetic spectra. The program provides laboratories with analysis problems that are difficult to create with natural matrix or spike samples and helps participants determine if there are problems in their data reduction software.

EML PROCEDURES MANUAL (HASL-300)

The 28th Edition of HASL-300, originally issued in 1957, provides a world renowned resource for analytical procedures and methods. The Manual is continually updated via EML's Web Site. In FY 1999, three new methods were added: "Preparation of Microprecipitation Sources for Reanalysis," "Iron in Aqueous Samples—Dual-DP Mode Liquid Scintillation Analysis," and "Technetium-99 in Water—TEVA Resin."



ENVIRONMENTAL TEST CHAMBER

EM, NN

EML's Environmental Chamber is a user facility with unique capabilities for generating controlled atmospheres with aerosols and radioactive gases. It is capable of maintaining a great range of a combination of environmental aerosol and radioactive aerosol parameters, and is ideally suited for the creation of a wide variety of regimes for sophisticated experiments and instrumental calibration and testing. Since the EML Environmental Chamber is the only facility in North America capable of measuring radon and thoron mixtures over a range of environmental and aerosol conditions, FEMP requested in FY 1999 that EML calibrate instruments used to monitor airborne alpha radioactivity in areas formerly used to process uranium and thorium.



TECHNICAL ASSISTANCE TO DOE HEADQUARTERS

EM, SC

EML supports EM and SC Headquarters by fulfilling important programmatic functions and responsibilities. As federal technical experts, the EML staff not only fulfills administrative roles, but more importantly provides technical direction for several programs. In these roles, EML adds value to these programs, highlights of which are described below.

C **HARACTERIZATION, MONITORING AND SENSOR TECHNOLOGY (CMST):** EML provides programmatic and technical support for the CMST activities. EML contributes its technical expertise by assessing proposals, monitoring project progress, evaluating project products, and assessing technology requirements, capabilities and limitations. During FY 1999 EML held functional responsibilities as Product Line Manager for DDFA and as project facilitators. EML also directly responded to requests for technical reviews and assistance.

J **OINT COORDINATING COMMITTEE ON ENVIRONMENTAL MANAGEMENT (JCCEM):** EML represents EM/OST as the Technical Program Manager for the Site Characterization and Contaminant Transport Focus Area of the JCCEM cooperative projects. The JCCEM is the managing body of a Memorandum of Cooperation between DOE/OST and the Russian Ministry of Atomic Energy (MINATOM). The JCCEM Russian and American scientists collaboratively study contaminant migration in groundwater, especially using the historical data and expertise associated with the Russian



nuclear production sites at Mayak, Tomsk and Krasnoyarsk and applying their use to DOE sites. The Technical Program Manager is responsible for ensuring that the technical direction and execution of the program are beneficial to the EM cleanup activities ongoing at DOE sites. During FY 1999, this JCCEM program received commitment from the Program Manager for the Ground Water/Vadose Zone Integration Project and from the DOE Richland (DOE-RL) Hanford Sitewide Modeling Program Manager on the applicability of JCCEM modeling of Russian waste sites for addressing contaminant migration and waste management issues at Hanford.

HUMAN SUBJECTS RESEARCH PROGRAM As part of the SC Office of Biological and Environmental Research (OBER) Human Subjects Research Program, the Human Subjects Research Database (HSRD) documents all research involving the use of human subjects that is currently funded by DOE, occurs at DOE facilities, is performed by DOE personnel or relates to DOE activities in compliance with Federal Policy for the Protection of Human Subjects (10 CFR 745). The HSRD was initiated in response to the Secretary of Energy's Openness Initiative (1994). EML performs the administrative and technical tasks associated with managing the HSRD. EML is responsible for creating, annually updating, maintaining and ensuring the quality of the database. EML also provides software development and participates in the Human Subjects Working Group. To make this information readily available to the public, the FY 1999 database can be accessed through OBER's Web Site (www.er.doe.gov/production/ober/humsubj/index.html).

STRATEGIC ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM (SERDP): SERDP identifies, develops, and transitions environmental technologies that relate directly to defense mission accomplishments. In FY 1999, EML continued its role as SERDP Technical Coordinator for all Departmental activities for the DOE Offices (SC, EM, DP, EH, FE, PO) and the National Laboratories with the DoD, EPA and other federal agencies partnering with SERDP. These activities included: developing the statements of needs related to DOE/DoD mission for projects to be funded by SERDP, providing guidance for the fiscal year program, reviewing and selecting proposals, and reviewing SERDP new-start and continuing research projects.

In addition to the role as SERDP Technical Coordinator, EML also participates as EM's representatives on the "Cleanup" and "Compliance" Technical Thrust Area Working Groups (TTAWG). EML participated in the In-Progress Reviews of projects funded in FY 1999, reviewed FY 2000 SERDP proposals, and developed the Statement of Need for the FY 2001 SERDP projects.

INTERAGENCY ARCTIC RESEARCH POLICY COMMITTEE (IARPC): The Arctic Research and Policy Act of 1984 (ARPA) provides for a comprehensive national policy dealing with national research needs and objectives in the Arctic. ARPA established an Arctic Research Commission (ARC) and the IARPC to help implement the Act. In conjunction with the ARC, IARPC establishes an integrated national Arctic research policy to guide federal agencies in developing and implementing their research programs in the Arctic. IARPC includes representatives from 13 federal agencies or offices, including DOE. In FY 1999, EML continued to provide staff representation for the DOE at all IARPC meetings to ensure coordination of Arctic research activities with other federal agencies.

THERMOLUMINESCENCE DOSIMETRY (TLD)

EM

Solid-state dosimeters are widely used for environmental monitoring around nuclear and radiological facilities. More than 21,000 stations worldwide are currently being monitored with such devices, encompassing fence line, off-site, residential, on-site, and long-term monitoring of areas awaiting cleanup. EML has played a major role in organizing and conducting the international dosimetry intercomparisons since their inception in 1974. These

intercomparisons serve to fill a global need for verification of TLDs. In FY 1999, EML began to organize the 12th International Intercomparison of Environmental Dosimeters in collaboration with BNL and NIST, which will be held in New York in the spring/summer of 2000.

EML's TLD measurements are also being utilized at BNL's Building 650 Sump Outfall Area and are providing accurate and precise data to show that contaminant movement is not taking place. These data are needed for regulatory purposes and will be important for establishing cleanup schedules and prioritization of areas of concern as remediation progresses throughout the BNL complex.



BNL PECONIC RIVER STUDY

Problems in survey design and quality control for an initial batch of sediment samples from the Peconic River in 1998 caused significant difficulties in data interpretation for BNL. In FY 1999, EML continued to provide technical assistance on sampling, radiochemical analyses and quality assurance to BNL in its efforts to characterize the magnitude and extent of any possible contamination, particularly plutonium, in the Peconic River and surrounding areas from past BNL operations. EML is also assisting the Suffolk County Health Department in performance testing of contractors to support the County's quality assurance efforts.

EM

WEST VALLEY DEMONSTRATION PROJECT

In FY 1999, EML entered into an agreement with the West Valley Demonstration Project to provide document review and assistance in resolving questions on waste characterization and closure engineering report data. Support is being provided in the preparation and review of the National Environmental Policy Act (NEPA) document for the completion of the West Valley Demonstration Project and closure or long-term management of facilities at the Western New York Nuclear Service Center. Additional technical assistance is given as requested, e.g., assumption confirmation, impacts estimation, and public presentation support.

EM

The CRE works with the DOE laboratories to integrate risk understanding in environmental issues in order to manage and solve national environmental cleanup and stewardship problems. EML is supporting the CRE in its management and analysis of the Cleanup Criterial Decision Document (C2D2) Database which was developed by EM. The C2D2 database currently contains information on cleanup levels for various contaminants and media for about 300 DOE site areas. The data is drawn from regulatory compliance documents such as Records of Decision (RODs) and DOE technical reports. Representing an EM investment of many years, the C2D2 database is a valuable source of information for cleanup, long-term stewardship and interactions with regulators.

In FY 1999, EML continued to lead CRE's effort by working closely with EM headquarters and the Argonne National Laboratory (ANL) to refine and update the database. EML is focusing on data analyses and the development of concise fact sheets in order to bring the database information to field managers who can use it in the development of restoration decisions. EML is also working with the Center and ANL to develop strategies for long-term management and to update the data for further in-depth analyses.

EML SCIENTIST RECEIVES VICE-PRESIDENT GORE'S HAMMER AWARD

As a member of the MARSSIM Workgroup, Carl V. Gogolak received the Hammer Award of Vice-President Gore's National Partnership for Reinventing Government. The MARSSIM team was recognized for working together to develop the new manual, which provides a single nationally consistent consensus guide for the process used to plan for, conduct, evaluate and document the measurements needed to show that a radioactively contaminated site has been cleaned up.



MARSSIM

NRC,EPA,EM

MARSSIM provides an enhanced, cost-effective process for gathering information on planning, conducting, evaluating, and documenting environmental radiological surveys of surface soil and building surfaces at nuclear sites undergoing D&D. As a multi-agency effort (DOE, DoD, NRC, Army, Navy, and the Air Force), this information will be used for demonstrating compliance with regulations across all agencies, and for developing D&D implementation plans. This process, accepted by the EPA and the NRC, will have a major impact on the D&D of nuclear facilities. Several commercial nuclear power utilities are evaluating implementation at their sites.

EML, after providing a lead technical role in the development of MARSSIM (NUREG-1575 and EPA 402-R-97-016, December 1997), is now participating in training courses on MARSSIM, including final status survey design, data analysis, data quality assessment, and statistical methodology. The training was developed jointly by the EPA Office of Radiation and Indoor Air (ORIA) and the DOE/EM National Environmental Training Office (NETO).

During FY 1999, the MARSSIM training course was given 15 times in 14 different cities to the professional staff from DOE field sites, EPA's Regional Offices, and state regulatory agencies. EML participated as an instructor for three modules—Statistics, Survey Planning and Design, and Final Status Survey Data Analysis—for each of the three-day training courses.

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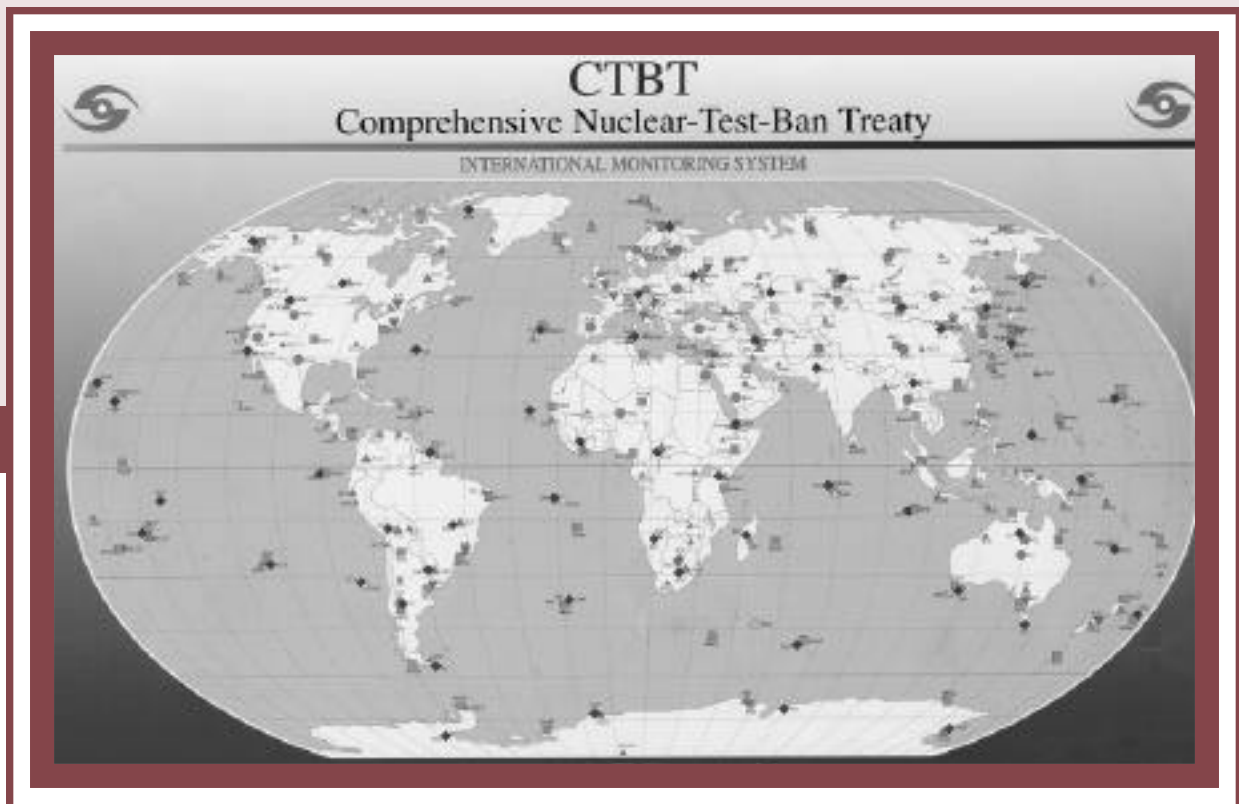
ROVIDES DOE AND OTHER FEDERAL AGENCIES WITH AN IN-HOUSE, HIGH-QUALITY SCIENTIFIC CAPABILITY TO ADDRESS IMPORTANT ISSUES RELATED TO NATIONAL SECURITY SUCH AS NONPROLIFERATION

The primary mission of the Detection and Deterrence Technologies Program of DOE's Office of Research and Development (NN-20) in the Office of Nonproliferation and National Security (NN-1) is to identify existing or potential nuclear proliferation threats anywhere in the world. EML supports this mission through the development and design of field and laboratory-based advanced

analytical instruments and technologies, coupled with techniques in sample collection, analysis, and data reduction to help identify potential signatures of proliferation activities. These systems, highlighted below, with their increased sensitivity and reliable minimal or unattended operation, provide NN and EM sites more effective monitoring capabilities for the detection of airborne radioactivity.

EML DESIGNATED U.S. RADIONUCLIDE LABORATORY

The U.S. Delegation to the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty (CTBT) Organization has selected EML as the new location for the U.S. radionuclide laboratory to be incorporated into the International Monitoring System (IMS) in support of the Comprehensive Nuclear-Test-Ban Treaty.



AUTORAMP II

A fully automated and completely unattended gamma-ray analysis system, AUTORAMP II collects large volume aerosol samples, measures these samples using a high resolution germanium detector, and immediately transmits the resultant spectra to a data center using either a satellite telephone link or land telephone lines. The AUTORAMP has been deployed at Patrick Air Force Base, FL, since November 1996 to monitor atmospheric radioactivity. In FY 1999, EML continued to pursue AUTORAMP II deployments at EM sites to monitor the presence, or absence of atmospheric radioactivity.

EM



NEW AUTORAMP DEVELOPMENT

For some applications, gamma-ray measurements are not suitable and alpha analyses are required. Airborne plutonium, for example, cannot be detected by gamma-ray analyses, but is detectable with alpha analyses. In FY 1999, a pilot study was initiated to determine the feasibility of adding alpha measurement capability to the AUTORAMP to enable the detection of gross alpha and to perform alpha spectrometry. The preliminary results, along with the work of others who have obtained alpha spectrometry with air ionization chambers, are encouraging and indicate a successful completion of this project.

EM

TAGGED AEROSOL GENERATOR (TAG) SYSTEM

EML's TAG, designed and constructed in FY 1999 for CTBT monitoring programs, will be used for *in situ* calibration of air sampling instrumentation in the field or at the production site. TAG will measure the collection efficiency of CTBT particulate samplers for the International Monitoring System site certification to verify that they meet required specifications.

NN



RADOMETER



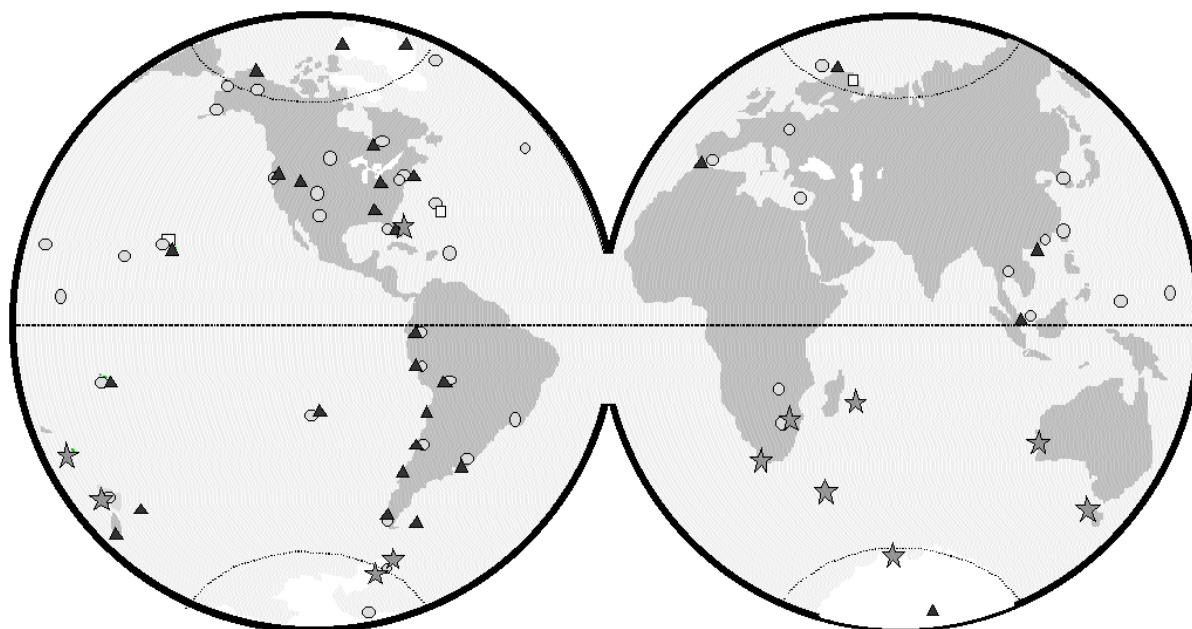
EML's Radometer is a portable survey instrument designed for real-time measurements of ^{222}Rn and ^{220}Rn . In FY 1999, a new application of the Radometer was pursued to utilize it in CTBT xenon monitoring for measuring ambient radon concentrations, which is a necessary correction for accurate xenon determination.

NN

EML's GLOBAL NETWORK

NN

EML maintains a worldwide network of aerosol and deposition sampling stations to document spatial and temporal trends in the distribution of artificial and naturally produced radionuclides in the atmosphere and to rapidly identify any new sources of activity due to accidental releases or violations of the CTBT. Data from remote on-site analysis systems are received via satellite. Samples are received, analyzed and reviewed at EML. EML's Global Network has become a valuable asset in monitoring compliance to treaties and in acting as an early warning system for nuclear releases.



▲ Surface Air Stations ○ Total Deposition Stations □ Radon Sampling Sites
★ Remote Atmospheric Measurements Program Stations

ENVIRONMENTAL SAMPLE ARCHIVE AND INTERNET DATABASE

NN

EML has developed and maintains a unique and extensive archive of more than 50,000 environmental samples, some of which were collected more than 40 years ago. Many of these historic samples, collected during the period of atmospheric nuclear weapons testing, have unique isotopic compositions and, therefore, can be used to test and evaluate instruments developed by the NN-20 community and others. In addition, the samples can be used for geolocation in forensic nuclear analyses, for identification of environmental signatures of nuclear activities, and for the establishment of current baseline values for selected environmental signatures. This archive of records is accessible over the Internet at EML's Web Site.



Mitchell D. Erickson, Director
Phone: (212) 620-3619
FAX: (212) 620-3651
e-mail: erickson@eml.doe.gov

EML Web Page: <http://www.eml.doe.gov>

Office of Science and Technology Web Page: <http://ost.em.doe.gov>

Environmental Measurements Laboratory
U.S. Department of Energy
201 Varick Street, 5th Floor
New York, NY 10014-4811